



SEQUENCE LISTING

<10> BAYER AG

<120> DNA encoding the tobacco phytoene synthase

<130> Le A 34 326

<140> US/09/847,081 A

<141> 2001-05-02

<160> 10

<170> PatentIn Ver. 2.1

<210> 1

<211> 1728

<212> DNA

<213> Nicotiana tabacum

<220>

<221> CDS

<222> (244)..(1566)

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gatagactct agtggatata tacaagtatt ggttttttga taaaataggc tgaggtgaga 180

aggtaacata aaggaaagac aaaaacttgg gaattgtttt agaccaccga ggtttcttgt 240

ttc atg agc atg tct gtt gct ttg ttg tgg gtt gtt tct ccc act tcc 288

Met Ser Met Ser Val Ala Leu Leu Trp Val Val Ser Pro Thr Ser

1 5 10 15

gag gtc tcg aat ggg aca gga ttg ttg gat tca gtc cga gaa gga aac 336

Glu Val Ser Asn Gly Thr Gly Leu Leu Asp Ser Val Arg Glu Gly Asn

20 25 30

cgc gtc ttt gta tca tcc agg ttc cta gct cga gat agg aat ttg atg 384

Arg Val Phe Val Ser Ser Arg Phe Leu Ala Arg Asp Arg Asn Leu Met	
35 40 45	
tgg aat ggg aga atc aag aaa ggt ggg aga caa agg tgg aat ttt ggc	432
Trp Asn Gly Arg Ile Lys Lys Gly Gly Arg Gln Arg Trp Asn Phe Gly	
50 55 60	
tct tta att gct gat cca aga tat tca tgc ttg ggt gga tca aga act	480
Ser Leu Ile Ala Asp Pro Arg Tyr Ser Cys Leu Gly Gly Ser Arg Thr	
65 70 75	
gaa aag gga agc act ttc tct gta cag tcc agt ttg gtg gct agc cca	528
Glu Lys Gly Ser Thr Phe Ser Val Gln Ser Ser Leu Val Ala Ser Pro	
80 85 90 95	
gct gga gaa atg act gtg tca tca gag aaa aag gtg tat gat gtg gta	576
Ala Gly Glu Met Thr Val Ser Ser Glu Lys Lys Val Tyr Asp Val Val	
100 105 110	
tta aag cag gca gct tta gtg aag agg cag ctg aga tct acc gat gat	624
Leu Lys Gln Ala Ala Leu Val Lys Arg Gln Leu Arg Ser Thr Asp Asp	
115 120 125	
tta gaa gtg aag ccg gat att gtt gtt cca ggg aat ttg ggc ttg ttg	672
Leu Glu Val Lys Pro Asp Ile Val Val Pro Gly Asn Leu Gly Leu Leu	
130 135 140	
agt gaa gca tat gat cgt tgt ggc gaa gta tgt gca gag tat gca aag	720
Ser Glu Ala Tyr Asp Arg Cys Gly Glu Val Cys Ala Glu Tyr Ala Lys	
145 150 155	
aca ttt tac tta gga acc aag cta atg acc cca gag aga aga aga gct	768
Thr Phe Tyr Leu Gly Thr Lys Leu Met Thr Pro Glu Arg Arg Arg Ala	
160 165 170 175	
atc tgg gca ata tat gtg tgg tgc agg aga acg gat gag ctt gtt gat	816
Ile Trp Ala Ile Tyr Val Trp Cys Arg Arg Thr Asp Glu Leu Val Asp	
180 185 190	
ggc cct aat gca tcc cac ata act ccg caa gct tta gat agg tgg gag	864
Gly Pro Asn Ala Ser His Ile Thr Pro Gln Ala Leu Asp Arg Trp Glu	
195 200 205	

acc agg ctg gaa gat att ttc agt ggg cgg cca ttt gat atg ctt gat 912
 Thr Arg Leu Glu Asp Ile Phe Ser Gly Arg Pro Phe Asp Met Leu Asp
 210 215 220

gct gct tta tcc gat act gtc tcc aga ttt cct gtt gat att cag cca 960
 Ala Ala Leu Ser Asp Thr Val Ser Arg Phe Pro Val Asp Ile Gln Pro
 225 230 235

ttc aga gat atg att gaa gga atg cgt atg gac ttg tgg aaa tcc aga 1008
 Phe Arg Asp Met Ile Glu Gly Met Arg Met Asp Leu Trp Lys Ser Arg
 240 245 250 255

tac aaa act ttc gat gag cta tat ctc tat tgt tac tat gtt gct ggt 1056
 Tyr Lys Thr Phe Asp Glu Leu Tyr Leu Tyr Cys Tyr Tyr Val Ala Gly
 260 265 270

act gta gga ttg atg agt gtt cca gtt atg ggt att gca cct gaa tca 1104
 Thr Val Gly Leu Met Ser Val Pro Val Met Gly Ile Ala Pro Glu Ser
 275 280 285

aag gca aca aca gag agt gta tat aat gct gct ttg gct tta ggg ctt 1152
 Lys Ala Thr Thr Glu Ser Val Tyr Asn Ala Ala Leu Ala Leu Gly Leu
 290 295 300

gca aat caa cta acc aat ata ctc aga gat gta gga gaa gat gcc aga 1200
 Ala Asn Gln Leu Thr Asn Ile Leu Arg Asp Val Gly Glu Asp Ala Arg
 305 310 315

aga gga aga gta tac ttg cct caa gat gaa tta gca cag gca ggg ctc 1248
 Arg Gly Arg Val Tyr Leu Pro Gln Asp Glu Leu Ala Gln Ala Gly Leu
 320 325 330 335

tcc gac gaa gac ata ttt gct gga aga gtg act gat aag tgg agg aac 1296
 Ser Asp Glu Asp Ile Phe Ala Gly Arg Val Thr Asp Lys Trp Arg Asn
 340 345 350

ttt atg aag aaa caa att cag agg gcg agg aaa ttc ttt gat gag tca 1344
 Phe Met Lys Lys Gln Ile Gln Arg Ala Arg Lys Phe Phe Asp Glu Ser
 355 360 365

gag aaa ggt gtc aca gaa ctg gac tct gct agt aga tgg cct gtg tta 1392

Glu Lys Gly Val Thr Glu Leu Asp Ser Ala Ser Arg Trp Pro Val Leu
 370 375 380

aca gcg ctg ctg ttg tat cgc aag ata ttg gac gag att gaa gcc aac 1440
 Thr Ala Leu Leu Leu Tyr Arg Lys Ile Leu Asp Glu Ile Glu Ala Asn
 385 390 395

gac tac aac aac ttc aca agg agg gct tat gtt agc aag cca aag aag 1488
 Asp Tyr Asn Asn Phe Thr Arg Arg Ala Tyr Val Ser Lys Pro Lys Lys
 400 405 410 415

ctt ctc acc ttg ccc att gct tat gca aaa tct ctt gtg ccc cct aat 1536
 Leu Leu Thr Leu Pro Ile Ala Tyr Ala Lys Ser Leu Val Pro Pro Asn
 420 425 430

aga act tcc tct cca cta gca aag aca tga atgaagtagt tgagtcaatg 1586
 Arg Thr Ser Ser Pro Leu Ala Lys Thr
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agtattatac actaaagaaa ctcaggtact tgtaaagtag atattcttttg ctaaagtgtg 1646

atcatcaaaa gtagattgta aattcaatat gacaatctct tggtagaata ttttctccac 1706

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<211> 440

<212> PRT

<213> Nicotiana tabacum

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Val Phe Val Ser Ser Arg Phe Leu Ala Arg Asp Arg Asn Leu Met Trp
 35 40 45

Asn Gly Arg Ile Lys Lys Gly Gly Arg Gln Arg Trp Asn Phe Gly Ser

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Leu Ile Ala Asp Pro Arg Tyr Ser Cys Leu Gly Gly Ser Arg Thr Glu			
65	70	75	80
Lys Gly Ser Thr Phe Ser Val Gln Ser Ser Leu Val Ala Ser Pro Ala			
	85	90	95
Gly Glu Met Thr Val Ser Ser Glu Lys Lys Val Tyr Asp Val Val Leu			
100	105	110	
Lys Gln Ala Ala Leu Val Lys Arg Gln Leu Arg Ser Thr Asp Asp Leu			
115	120	125	
Glu Val Lys Pro Asp Ile Val Val Pro Gly Asn Leu Gly Leu Leu Ser			
130	135	140	
Glu Ala Tyr Asp Arg Cys Gly Glu Val Cys Ala Glu Tyr Ala Lys Thr			
145	150	155	160
Phe Tyr Leu Gly Thr Lys Leu Met Thr Pro Glu Arg Arg Arg Ala Ile			
	165	170	175
Trp Ala Ile Tyr Val Trp Cys Arg Arg Thr Asp Glu Leu Val Asp Gly			
180	185	190	
Pro Asn Ala Ser His Ile Thr Pro Gln Ala Leu Asp Arg Trp Glu Thr			
195	200	205	
Arg Leu Glu Asp Ile Phe Ser Gly Arg Pro Phe Asp Met Leu Asp Ala			
210	215	220	
Ala Leu Ser Asp Thr Val Ser Arg Phe Pro Val Asp Ile Gln Pro Phe			
225	230	235	240
Arg Asp Met Ile Glu Gly Met Arg Met Asp Leu Trp Lys Ser Arg Tyr			
245	250	255	
Lys Thr Phe Asp Glu Leu Tyr Leu Tyr Cys Tyr Tyr Val Ala Gly Thr			
260	265	270	
Val Gly Leu Met Ser Val Pro Val Met Gly Ile Ala Pro Glu Ser Lys			

275	280	285
Ala Thr Thr Glu Ser Val Tyr Asn Ala Ala Leu Ala L u Gly Leu Ala		
290	295	300
Asn Gln Leu Thr Asn Ile Leu Arg Asp Val Gly Glu Asp Ala Arg Arg		
305	310	315 320
Gly Arg Val Tyr Leu Pro Gln Asp Glu Leu Ala Gln Ala Gly Leu Ser		
325	330	335
Asp Glu Asp Ile Phe Ala Gly Arg Val Thr Asp Lys Trp Arg Asn Phe		
340	345	350
Met Lys Lys Gln Ile Gln Arg Ala Arg Lys Phe Phe Asp Glu Ser Glu		
355	360	365
Lys Gly Val Thr Glu Leu Asp Ser Ala Ser Arg Trp Pro Val Leu Thr		
370	375	380
Ala Leu Leu Leu Tyr Arg Lys Ile Leu Asp Glu Ile Glu Ala Asn Asp		
385	390	395 400
Tyr Asn Asn Phe Thr Arg Arg Ala Tyr Val Ser Lys Pro Lys Lys Leu		
405	410	415
Leu Thr Leu Pro Ile Ala Tyr Ala Lys Ser Leu Val Pro Pro Asn Arg		
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Thr Ser Ser Pro Leu Ala Lys Thr		
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<213> Nicotiana tabacum

<220>

<221> CDS

<222> (333)..(1565)

<220>

<221> unsure

<222> 135, 139

<223> Xaa is unknown or other

<220>

<221> unsure

<222> 51

<223> n can be any nucleotide

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gtttgcttta tttgtgggct ttttataatc ttttttccac aagggaaagt gggatatttc 180

ttgaaagtgg atttagactc tagtggaat ctactaggag taaatttatt aattttttat 240

aaattaagca gaggaaggaa ggaaacagaa aacagaaagt aagacaaaaa accttggaat 300

tgtttttagaa agccaagggtt ttctgttca aa atg tct gtt gcc ttg tta tgg 353

Met Ser Val Ala Leu Leu Trp

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gtt gtt tca cct tgt gaa gtc tca aat ggg aca gga ttc ttg gat tca 401

Val Val Ser Pro Cys Glu Val Ser Asn Gly Thr Gly Phe Leu Asp Ser

10

15

20

gtc cgg gag gga aac cgg gtt ttt gat tgc tgc agg cat agg aat tta 449

Val Arg Glu Gly Asn Arg Val Phe Asp Ser Ser Arg His Arg Asn Leu

25

30

35

gtg tgc aat gag aga aac aag aga ggt gtg aaa caa agg tgg aat ttt 497

Val Cys Asn Glu Arg Asn Lys Arg Gly Val Lys Gln Arg Trp Asn Phe

40

45

50

55

ggg tct gta agg tct gct atg gtg gct aca ccg gcg gga gaa atg gcg 545

Gly Ser Val Arg Ser Ala Met Val Ala Thr Pro Ala Gly Glu Met Ala

60

65

70

acg atg aca tca gaa cag atg gtt tat gat gtg gtt tta aaa caa gca 593

Thr Met Thr Ser Glu Gln Met Val Tyr Asp Val Val Leu Lys Gln Ala

75	80	85	
gct tta gtg aag agg cag ttg aga tct gct gat gat tta gaa gtg aag			641
Ala Leu Val Lys Arg Gln Leu Arg Ser Ala Asp Asp Leu Glu Val Lys			
90	95	100	
ccg gag atc cct ctc ccc ggg aat ttg agc ttg ttg agt gaa gca tat			689
Pro Glu Ile Pro Leu Pro Gly Asn Leu Ser Leu Leu Ser Glu Ala Tyr			
105	110	115	
gat agg tgt agt gaa gta tgt gca gag tat gca aag aca ttt tac tth			737
Asp Arg Cys Ser Glu Val Cys Ala Glu Tyr Ala Lys Thr Phe Tyr Xaa			
120	125	130	135
gga acc atg yta atg act cca gag aga aga agg gct att tgg gca ata			785
Gly Thr Met Xaa Met Thr Pro Glu Arg Arg Arg Ala Ile Trp Ala Ile			
140	145	150	
tat gtg tgg tgc agg aga aca gat gaa ctt gtt gat ggc cca aac gca			833
Tyr Val Trp Cys Arg Arg Thr Asp Glu Leu Val Asp Gly Pro Asn Ala			
155	160	165	
tca cat att aca ccc caa gcc tta gat agg tgg gaa gac cgg ctt gaa			881
Ser His Ile Thr Pro Gln Ala Leu Asp Arg Trp Glu Asp Arg Leu Glu			
170	175	180	
gat gtt ttc agc ggg cga cca ttt gat atg ctc gat gct gct ttg tcc			929
Asp Val Phe Ser Gly Arg Pro Phe Asp Met Leu Asp Ala Ala Leu Ser			
185	190	195	
gat act gtt tcc aag ttt cca gtt gat att cag ccg ttc aga gat atg			977
Asp Thr Val Ser Lys Phe Pro Val Asp Ile Gln Pro Phe Arg Asp Met			
200	205	210	215
att gaa gga atg cgt atg gac ttg agg aag tca aga tat aga aac ttt			1025
Ile Glu Gly Met Arg Met Asp Leu Arg Lys Ser Arg Tyr Arg Asn Phe			
220	225	230	
gat gag ctt tac ctc tat tgt tat tac gtt gct ggt acg gtt ggg ttg			1073
Asp Glu Leu Tyr Leu Tyr Cys Tyr Tyr Val Ala Gly Thr Val Gly Leu			
235	240	245	

atg agt gtt cca att atg ggt att gca cct gat tca aag gca aca aca	1121
Met Ser Val Pro Ile Met Gly Ile Ala Pro Asp Ser Lys Ala Thr Thr	
250 255 260	
 gag agc gta tat aat gca gct ttg gct tta gga atc gca aat caa cta	1169
Glu Ser Val Tyr Asn Ala Ala Leu Ala Leu Gly Ile Ala Asn Gln Leu	
265 270 275	
 acg aac ata ctc aga gat gtt gga gaa gat gcc aga aga gga aga gtc	1217
Thr Asn Ile Leu Arg Asp Val Gly Glu Asp Ala Arg Arg Gly Arg Val	
280 285 290 295	
 tac tta cct caa gat gaa tta gca cag gca ggt ctc ttc gac gat gac	1265
Tyr Leu Pro Gln Asp Glu Leu Ala Gln Ala Gly Leu Phe Asp Asp Asp	
300 305 310	
 ata ttt gct gga aaa gtg act gat aag tgg aga agc ttt atg aag aag	1313
Ile Phe Ala Gly Lys Val Thr Asp Lys Trp Arg Ser Phe Met Lys Lys	
315 320 325	
 caa atc cag agg gca aga aag ttc ttc gat gag gca gag gaa gga gtt	1361
Gln Ile Gln Arg Ala Arg Lys Phe Phe Asp Glu Ala Glu Glu Gly Val	
330 335 340	
 aca caa ctg agc tca gct agc aga tgg cct gta tgg gca tct ttg ctg	1409
Thr Gln Leu Ser Ser Ala Ser Arg Trp Pro Val Trp Ala Ser Leu Leu	
345 350 355	
 ttg tac cgc caa ata ctg gac gag att gaa gcc aat gac tac aac aac	1457
Leu Tyr Arg Gln Ile Leu Asp Glu Ile Glu Ala Asn Asp Tyr Asn Asn	
360 365 370 375	
 ttc aca aag aga gct tat gtg agc aaa cca aag aag cta att tcc tta	1505
Phe Thr Lys Arg Ala Tyr Val Ser Lys Pro Lys Lys Leu Ile Ser Leu	
380 385 390	
 cct att gct tat gca aaa tct ctt gtg ccc cct aca aga act ctt gtc	1553
Pro Ile Ala Tyr Ala Lys Ser Leu Val Pro Pro Thr Arg Thr Leu Val	
395 400 405	
 acc tct agc taa ggcatagaca tcagatttaa attaaagcaa gaaagcatat	1605
Thr Ser Ser	

410

actgttaaaa aagaaagaat ttctaaagta gatattgttg tattgatgcc acttgtatat 1665

catcaaaaagt aggtagtaaa atccaatata acaatctcta gtagttg 1712

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<211> 410

<212> PRT

<213> Nicotiana tabacum

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<221> unsure

<222> 135, 139

<223> Xaa is unknown or other

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30

Ser Ser Arg His Arg Asn Leu Val Cys Asn Glu Arg Asn Lys Arg Gly

35

40

45

Val Lys Gln Arg Trp Asn Phe Gly Ser Val Arg Ser Ala Met Val Ala

50

55

60

Thr Pro Ala Gly Glu Met Ala Thr Met Thr Ser Glu Gln Met Val Tyr

65

70

75

80

Asp Val Val Leu Lys Gln Ala Ala Leu Val Lys Arg Gln Leu Arg Ser

85

90

95

Ala Asp Asp Leu Glu Val Lys Pro Glu Ile Pro Leu Pro Gly Asn Leu

100

105

110

Ser Leu Leu Ser Glu Ala Tyr Asp Arg Cys Ser Glu Val Cys Ala Glu

115

120

125

Tyr Ala Lys Thr Phe Tyr Xaa Gly Thr Met Xaa Met Thr Pro Glu Arg

130	135	140
Arg Arg Ala Ile Trp	Ala Ile Tyr Val Trp	Cys Arg Arg Thr Asp Glu
145	150	155 160
Leu Val Asp Gly Pro Asn	Ala Ser His Ile Thr	Pro Gln Ala Leu Asp
165	170	175
Arg Trp Glu Asp Arg	Leu Glu Asp Val Phe	Ser Gly Arg Pro Phe Asp
180	185	190
Met Leu Asp Ala Ala	Leu Ser Asp Thr	Val Ser Lys Phe Pro Val Asp
195	200	205
Ile Gln Pro Phe Arg	Asp Met Ile Glu Gly	Met Arg Met Asp Leu Arg
210	215	220
Lys Ser Arg Tyr Arg	Asn Phe Asp Glu	Leu Tyr Leu Tyr Cys Tyr Tyr
225	230	235 240
Val Ala Gly Thr Val	Gly Leu Met Ser	Val Pro Ile Met Gly Ile Ala
245	250	255
Pro Asp Ser Lys Ala	Thr Thr Glu Ser	Val Tyr Asn Ala Ala Leu Ala
260	265	270
Leu Gly Ile Ala Asn	Gln Leu Thr Asn	Ile Leu Arg Asp Val Gly Glu
275	280	285
Asp Ala Arg Arg Gly	Arg Val Tyr Leu	Pro Gln Asp Glu Leu Ala Gln
290	295	300
Ala Gly Leu Phe Asp	Asp Asp Ile Phe	Ala Gly Lys Val Thr Asp Lys
305	310	315 320
Trp Arg Ser Phe Met	Lys Lys Gln Ile	Gln Arg Ala Arg Lys Phe Phe
325	330	335
Asp Glu Ala Glu Glu	Gly Val Thr Gln	Leu Ser Ser Ala Ser Arg Trp
340	345	350
Pro Val Trp Ala Ser	Leu Leu Leu Tyr	Arg Gln Ile Leu Asp Glu Ile

355

360

365

Glu Ala Asn Asp Tyr Asn Asn Phe Thr Lys Arg Ala Tyr Val Ser Lys
 370 375 380

Pro Lys Lys Leu Ile Ser Leu Pro Ile Ala Tyr Ala Lys Ser Leu Val
 385 390 395 400

Pro Pro Thr Arg Thr Leu Val Thr Ser Ser
 405 410

<210> 5

<211> 2205

<212> DNA

<213> Nicotiana tabacum

<220>

<221> CDS

<222> (189)..(1955)

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cattttcttg gcatttgaca acaaaagggt ccattttttt tcctttttgc tgtatatagc 180

acaattca atg gct act tct tca gct tat ctt tgt tgt cct gca act tct 230

Met Ala Thr Ser Ser Ala Tyr Leu Cys Cys Pro Ala Thr Ser

1

5

10

gct act gga aag aaa cat att ttg cca aat ggg tca gct gga ttc ttg 278

Ala Thr Gly Lys Lys His Ile Leu Pro Asn Gly Ser Ala Gly Phe Leu

15

20

25

30

gtt ttc cgt ggt ccc cgt ttg tcc aac cgg ttt gtg acc cgg aag tca 326

Val Phe Arg Gly Pro Arg Leu Ser Asn Arg Phe Val Thr Arg Lys Ser

35

40

45

gtt att cgt gct gat ttg gac tcc atg gtc tct gat atg agt act aat 374

Val Ile Arg Ala Asp Leu Asp Ser Met Val Ser Asp Met Ser Thr Asn	
50 55 60	
gct cca aaa ggg cta ttt cca cct gaa cct gaa cat tat cgg ggg cca	422
Ala Pro Lys Gly Leu Phe Pro Pro Glu Pro Glu His Tyr Arg Gly Pro	
65 70 75	
aag ctg aaa gta gct att att gga gct ggg ctt gca ggc atg tca act	470
Lys Leu Lys Val Ala Ile Ile Gly Ala Gly Leu Ala Gly Met Ser Thr	
80 85 90	
gct gtg gag ctc ttg gat caa gga cat gag gtg gat ata tat gaa tca	518
Ala Val Glu Leu Leu Asp Gln Gly His Glu Val Asp Ile Tyr Glu Ser	
95 100 105 110	
agg cct ttt att ggt ggg aaa gtg gga tct ttt gtt gat aga cgt gga	566
Arg Pro Phe Ile Gly Gly Lys Val Gly Ser Phe Val Asp Arg Arg Gly	
115 120 125	
aac cac att gaa atg gga ctg cat gtg ttc ttt ggt tgc tat aat aat	614
Asn His Ile Glu Met Gly Leu His Val Phe Phe Gly Cys Tyr Asn Asn	
130 135 140	
ttg ttc cgt ttg tta aaa aag gtg ggt gct gaa aaa aat ctg cta gtg	662
Leu Phe Arg Leu Leu Lys Lys Val Gly Ala Glu Lys Asn Leu Leu Val	
145 150 155	
aag gac cat act cac aca ttt gta aat aaa ggg ggt gaa ata ggg gag	710
Lys Asp His Thr His Thr Phe Val Asn Lys Gly Gly Glu Ile Gly Glu	
160 165 170	
ctt gat ttc cgc ttt cca gtt gga gca ccc cta cac gga att aat gca	758
Leu Asp Phe Arg Phe Pro Val Gly Ala Pro Leu His Gly Ile Asn Ala	
175 180 185 190	
ttt ttg tct acc aat cag cta aag att tat gat aag gct aga aat gct	806
Phe Leu Ser Thr Asn Gln Leu Lys Ile Tyr Asp Lys Ala Arg Asn Ala	
195 200 205	
gta gct ctt gcc ctt agt cca gtg gtg cgg gct tta gtt gat cca gat	854
Val Ala Leu Ala Leu Ser Pro Val Val Arg Ala Leu Val Asp Pro Asp	
210 215 220	

ggc gcg ttg cag cag ata cgt gat cta gat agt gta agc ttt tca gag 902
 Gly Ala Leu Gln Gln Ile Arg Asp Leu Asp Ser Val Ser Phe Ser Glu
 225 230 235

tgg ttt atg tct aaa ggt ggg acg cgt gct agc atc cag agg atg tgg 950
 Trp Phe Met Ser Lys Gly Gly Thr Arg Ala Ser Ile Gln Arg Met Trp
 240 245 250

gat cct gtc gca tat gct ctt gga ttc att gac tgt gac aat atc agt 998
 Asp Pro Val Ala Tyr Ala Leu Gly Phe Ile Asp Cys Asp Asn Ile Ser
 255 260 265 270

gct cgg tgt atg ctc act ata ttt gca tta ttt gcc act aaa acg gag 1046
 Ala Arg Cys Met Leu Thr Ile Phe Ala Leu Phe Ala Thr Lys Thr Glu
 275 280 285

gct tcc cta tta cgc atg ctt aaa ggt tct ccg gac gtt tat ttg agt 1094
 Ala Ser Leu Leu Arg Met Leu Lys Gly Ser Pro Asp Val Tyr Leu Ser
 290 295 300

ggt cca att aag aag tac atc ttg gat aag ggg gga agg ttt cac atg 1142
 Gly Pro Ile Lys Lys Tyr Ile Leu Asp Lys Gly Gly Arg Phe His Met
 305 310 315

agg tgg ggg tgc aga cag gta ctc tat gag aca tcc tct gat ggc agt 1190
 Arg Trp Gly Cys Arg Gln Val Leu Tyr Glu Thr Ser Ser Asp Gly Ser
 320 325 330

atg tat gtc agc ggg ctt gcc atg tca aag gcc act cag aag aaa gtt 1238
 Met Tyr Val Ser Gly Leu Ala Met Ser Lys Ala Thr Gln Lys Lys Val
 335 340 345 350

gta aaa gct gat gcc tat gtc gct gca tgt gat gtc cct gga att aaa 1286
 Val Lys Ala Asp Ala Tyr Val Ala Ala Cys Asp Val Pro Gly Ile Lys
 355 360 365

cga ttg gta cct cag aag tgg agg gaa ttg gaa ttc ttt gac aac att 1334
 Arg Leu Val Pro Gln Lys Trp Arg Glu Leu Glu Phe Phe Asp Asn Ile
 370 375 380

tac aaa ttg gtt gga gtg cct gtt gtt acg gta caa cta cga tac aat 1382

Tyr Lys Leu Val Gly Val Pro Val Val Thr Val Gln Leu Arg Tyr Asn
 385 390 395

ggc tgg gtt aca gag ttg cag gac ttg gag cgt tcg agg caa ttg aag 1430
 Gly Trp Val Thr Glu Leu Gln Asp Leu Glu Arg Ser Arg Gln Leu Lys
 400 405 410

cgc gct aca ggt ttg gac aat ctc ctg tat aca cca gat gca gat ttc 1478
 Arg Ala Thr Gly Leu Asp Asn Leu Leu Tyr Thr Pro Asp Ala Asp Phe
 415 420 425 430

tct tgc ttt gcg gac ctt gca ttg gca tct cct gaa gat tat tac att 1526
 Ser Cys Phe Ala Asp Leu Ala Leu Ala Ser Pro Glu Asp Tyr Tyr Ile
 435 440 445

gag ggc caa ggc tca ttg ctt caa tgt gtc ctt aca cct ggt gac cct 1574
 Glu Gly Gln Gly Ser Leu Leu Gln Cys Val Leu Thr Pro Gly Asp Pro
 450 455 460

tac atg cct cta cta aat gat gaa atc ata aaa aga gtg tca aag cag 1622
 Tyr Met Pro Leu Leu Asn Asp Glu Ile Ile Lys Arg Val Ser Lys Gln
 465 470 475

gtt ttg gca cta ttt cct tct tcc caa ggt ctt gag gtt acc tgg tca 1670
 Val Leu Ala Leu Phe Pro Ser Ser Gln Gly Leu Glu Val Thr Trp Ser
 480 485 490

tca gtt gtg aaa att ggg caa tcc cta tat cgt gaa gga cct ggt aaa 1718
 Ser Val Val Lys Ile Gly Gln Ser Leu Tyr Arg Glu Gly Pro Gly Lys
 495 500 505 510

gac cca ttc aga cct gat cag aag act cca gtg gaa aat ttc ttt ctt 1766
 Asp Pro Phe Arg Pro Asp Gln Lys Thr Pro Val Glu Asn Phe Phe Leu
 515 520 525

gct ggc tca tat aca aaa cag gac tac ata gat agc atg gaa ggg gca 1814
 Ala Gly Ser Tyr Thr Lys Gln Asp Tyr Ile Asp Ser Met Glu Gly Ala
 530 535 540

act ctt tca ggt agg caa gca tct gca tac gta tgt gat gct ggc gag 1862
 Thr Leu Ser Gly Arg Gln Ala Ser Ala Tyr Val Cys Asp Ala Gly Glu
 545 550 555

aag ctg gtg gtg ttg cgg aaa aag att gct gct gct gag tca aac gag 1910
 Lys Leu Val Val Leu Arg Lys Lys Ile Ala Ala Ala Glu Ser Asn Glu
 560 565 570

atc tct gaa ggt gta tca gta tct gat gag ttg agt ctt gtc tga 1955
 Ile Ser Glu Gly Val Ser Val Ser Asp Glu Leu Ser Leu Val
 575 580 585

tgactggaaa tcatccaatg aatactgaag agcaccccc actttgttaa tccgagaagc 2015

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Arg Gly Pro Arg Leu Ser Asn Arg Phe Val Thr Arg Lys Ser Val Ile
 35 40 45

Arg Ala Asp Leu Asp Ser Met Val Ser Asp Met Ser Thr Asn Ala Pro
 50 55 60

Lys Gly Leu Phe Pro Pro Glu Pro Glu His Tyr Arg Gly Pro Lys Leu
 65 70 75 80

Lys Val Ala Ile Ile Gly Ala Gly Leu Ala Gly Met Ser Thr Ala Val

85

90

95

Glu Leu Leu Asp Gln Gly His Glu Val Asp Ile Tyr Glu Ser Arg Pro
 100 105 110

Phe Ile Gly Gly Lys Val Gly Ser Phe Val Asp Arg Arg Gly Asn His
 115 120 125

Ile Glu Met Gly Leu His Val Phe Phe Gly Cys Tyr Asn Asn Leu Phe
 130 135 140

Arg Leu Leu Lys Lys Val Gly Ala Glu Lys Asn Leu Leu Val Lys Asp
 145 150 155 160

His Thr His Thr Phe Val Asn Lys Gly Gly Glu Ile Gly Glu Leu Asp
 165 170 175

Phe Arg Phe Pro Val Gly Ala Pro Leu His Gly Ile Asn Ala Phe Leu
 180 185 190

Ser Thr Asn Gln Leu Lys Ile Tyr Asp Lys Ala Arg Asn Ala Val Ala
 195 200 205

Leu Ala Leu Ser Pro Val Val Arg Ala Leu Val Asp Pro Asp Gly Ala
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Leu Gln Gln Ile Arg Asp Leu Asp Ser Val Ser Phe Ser Glu Trp Phe
 225 230 235 240

Met Ser Lys Gly Gly Thr Arg Ala Ser Ile Gln Arg Met Trp Asp Pro
 245 250 255

Val Ala Tyr Ala Leu Gly Phe Ile Asp Cys Asp Asn Ile Ser Ala Arg
 260 265 270

Cys Met Leu Thr Ile Phe Ala Leu Phe Ala Thr Lys Thr Glu Ala Ser
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Leu Leu Arg Met Leu Lys Gly Ser Pro Asp Val Tyr Leu Ser Gly Pro
 290 295 300

Ile Lys Lys Tyr Ile Leu Asp Lys Gly Gly Arg Phe His Met Arg Trp

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Gly Cys Arg Gln Val Leu Tyr Glu Thr Ser Ser Asp Gly Ser Met Tyr			
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Val Ser Gly Leu Ala Met Ser Lys Ala Thr Gln Lys Lys Val Val Lys			
340	345	350	
Ala Asp Ala Tyr Val Ala Ala Cys Asp Val Pro Gly Ile Lys Arg Leu			
355	360	365	
Val Pro Gln Lys Trp Arg Glu Leu Glu Phe Phe Asp Asn Ile Tyr Lys			
370	375	380	
Leu Val Gly Val Pro Val Val Thr Val Gln Leu Arg Tyr Asn Gly Trp			
385	390	395	400
Val Thr Glu Leu Gln Asp Leu Glu Arg Ser Arg Gln Leu Lys Arg Ala			
405	410	415	
Thr Gly Leu Asp Asn Leu Leu Tyr Thr Pro Asp Ala Asp Phe Ser Cys			
420	425	430	
Phe Ala Asp Leu Ala Leu Ala Ser Pro Glu Asp Tyr Tyr Ile Glu Gly			
435	440	445	
Gln Gly Ser Leu Leu Gln Cys Val Leu Thr Pro Gly Asp Pro Tyr Met			
450	455	460	
Pro Leu Leu Asn Asp Glu Ile Ile Lys Arg Val Ser Lys Gln Val Leu			
465	470	475	480
Ala Leu Phe Pro Ser Ser Gln Gly Leu Glu Val Thr Trp Ser Ser Val			
485	490	495	
Val Lys Ile Gly Gln Ser Leu Tyr Arg Glu Gly Pro Gly Lys Asp Pro			
500	505	510	
Phe Arg Pro Asp Gln Lys Thr Pro Val Glu Asn Phe Phe Leu Ala Gly			
515	520	525	
Ser Tyr Thr Lys Gln Asp Tyr Ile Asp Ser Met Glu Gly Ala Thr Leu			

530	535	540	
Ser Gly Arg Gln Ala Ser Ala Tyr Val Cys Asp Ala Gly Glu Lys Leu			
545	550	555	560
Val Val Leu Arg Lys Lys Ile Ala Ala Ala Glu Ser Asn Glu Ile Ser			
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22

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